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06/18/2003

COUDERT BROTHERS
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EXAMINER

AHMED, SHAMIM

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 06/18/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/881,514

Applicant(s)

BEILIN ET AL.

Examiner

Shamim Ahmed

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 22-54 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 45-47 is/are allowed.
- 6) ☒ Claim(s) 22-44 and 48-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on 12/30/02 is sufficient to overcome the objection to drawing 18 and claim 39.

The amendment is also sufficient to overcome the 112 first and second paragraph rejections of the previous office action mailed 9/24/02.

Accordingly, the objections to the drawing and the claim and the 112 first and second paragraph rejections are withdrawn.

The claims 22-44 and 48-54 are still rejected as below.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

3. Claims 30-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Both the claims 30 and 31 recite the limitation "the phosphoric acid" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 29, 34 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Joshi et al (5,731,245).

As to claims 29 and 35, Joshi et al disclose a method for fabricating circuits, wherein a protruding structure of copper (Cu) is capped with a refractory metal such as tungsten (W), which resembles the material layer (col.7, lines 35-43 and figure 1A).

Joshi et al also disclose that a tungsten-germanium (W-Ge) alloy hard cap is deposited over the refractory metal and the metalization, wherein tungsten-germanium alloy layer is used as wear-resistant polish-stop in the chemical mechanical polishing process (col.8, lines 15-34).

So, Joshi et al teach that the material layer and the copper are simultaneously polished until contacting the polish-stop layer.

As to claim 34, Joshi et al teach that a tungsten-germanium (W-Ge) alloy hard cap is deposited over the refractory metal and the metalization or copper, wherein the alloy does not contain copper material (col.8, lines 15-34).

So, the structure is partially embedded in a layer of material, which does not contain copper material.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1765

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 22-28, 30-33, 36-44 and 48-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joshi et al (5,731,245) as applied to claims 29, 34-35 above and further in view of Roberts (4,959,113).

As to claims 22, 39-44, 47-53, Joshi et al disclose a method for fabricating circuits, wherein a protruding structure of copper (Cu) is capped with a refractory metal such as tungsten (W), which resembles the material layer (col.7, lines 35-43).

Joshi et al also disclose that a tungsten-germanium (W-Ge) alloy hard cap is deposited over the refractory metal and the metalization, wherein tungsten-germanium alloy layer is used as wear-resistant polish-stop in the chemical mechanical polishing process (col.8, lines 15-34).

So, Joshi et al teach that the material layer and the copper are simultaneously polished until contacting the polish-stop layer.

Joshi et al fail to disclose that the polishing slurry comprises phosphoric acid.

Art Unit: 1765

However, Roberts discloses a polishing composition comprises an abrasive agent and phosphoric for polishing metal surface such as copper, wherein phosphoric acid is beneficial to the polishing process by lowering the pH of the composition (col.1, line 66-col.2, line 5 and col.3, lines 63-68).

As to claims 25-26, 32-33 and 37-38, Roberts also discloses that pH of the slurry is maintain in the range of about 1-6 (col.3, lines 63-col.4, line 2).

As to claims 30-31, Roberts teaches a concentration of the phosphoric acid but does not teach the exact concentration.

However, it would have been obvious to one skilled in the art to find the optimum concentration by routine experimentation.

As to claims 32-33, and 37-38, Roberts also discloses that pH of the slurry is maintain in the range of about 1-6 (col.3, lines 63-col.4, line 2).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of claimed invention to combine Roberts's teaching into Joshi et al's method to enhance the polishing process as taught by Roberts.

As to claim 36, Joshi et al teach that the polish-stop layer is more resistant to the polishing slurry (col.8, lines 18-22).

So, the polishing rate of the tungsten is decreased, while polishing the material layer and the copper without decreasing the polishing rate.

Allowable Subject Matter

10. Claims 45-47 are allowable over prior art.
11. The following is a statement of reasons for the indication of allowable subject matter: The prior art also does not teach forming a polish-stop layer in such that a portion of the material layer and the copper extends above the polish-stop layer.

The prior art also does not teach forming a pair of polish-stop layer in such that a portion of the material and the protruding copper structure extends between and above the pair of polish-stop layers.

Response to Arguments

12. Applicant's arguments filed 12/30/02 have been fully considered but they are not persuasive.

Applicants argue that Joshi et al do not teach a process of polishing a protruding structure.

This is not persuasive because Joshi et al teach that a polish-stop layer comprising tungsten over the material layer and copper, which is protruding from a surface (see the rejection above and figure 1A).

Examiner also point out that Joshi et al's deposited all the layers such as copper, tungsten and the hard-cap comprising tungsten are protruding from a surface and furthermore, applicants do not specifically claim that the copper is protruding from the surface.

Applicants also argue that the enhanced performance referred to Roberts refers to the ability to form a smooth surface, not to act as a better polish top layer.

This is not persuasive because the addition of the phosphoric acid will increase the etching or polishing performance of metal and that has nothing to do with not to act as a better polish-stop layer.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (703) 305-1929. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-


Art Unit: 1765

872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Shamim Ahmed
Examiner
Art Unit 1765

SA
June 11, 2003



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SUPERVISORY PATENT EXAMINER
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